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# Section 2

## Uintah Basin Plan

### Utah State Water Plan

## Executive Summary

This section summarizes the *Uintah Basin Plan*. Like the *State Water Plan*, the *Uintah Basin Plan* contains 19 sections. It also has Section A, Acronyms, Abbreviations and Definitions, and Section B, Bibliography. Headings used in the Executive Summary coincide with those used in the body of this plan and the *State Water Plan*.

### 2.1 Foreword

The *State Water Plan* (1990) provides the foundation and general direction for managing waters of the state. Detailed plans for the Bear River, Kanab Creek/Virgin River, Cedar/Beaver, Weber River, Jordan River, Utah Lake and Sevier River basins are completed. This plan is number eight. The remainder of the 11 basin plans are nearing publication.

The purpose of this plan is to identify potential conservation and development projects and describe alternatives to satisfy the problems, needs and demands. It will also disseminate valuable water-related public information; encourage community and economic growth; provide opportunity for local, state and federal cooperation; identify water supplies and needs, and promote local involvement in water planning.

### 2.3 Introduction

Section 3 contains general guidelines used to ensure continuity during plan preparation. It explains the organizational structure and process for reviews and for making comments at various stages. It also describes the settlement, history, climate, physical characteristics and land ownership in the basin.

The Uintah Basin is divided into two drainages; the north slope and the south slope of the Uinta Mountains. The north slope is bounded by the Uinta Mountains to the south, the Wyoming border to the north, the Colorado border to the east, and the Bear River drainage to the west. The south slope is bounded by the Uinta Mountains to the north, the Tavaputs Plateau and the Book Cliffs to the south, Diamond Mountain and the Utah/Colorado border to the east, and the Wasatch Range to the west.



Brown Duck Basin

This basin covers 6,969,600 acres, of which 73 percent is administered by the federal government and the Bureau of Indian Affairs. State government administers 8 percent and 19 percent is private land.

The annual precipitation ranges from 7.1 inches at Roosevelt to 12.5 inches at Flaming Gorge Reservoir. The monthly maximum mean temperature reaches 94.6 degrees in July and a minimum mean 2.5 degrees in January. Elevations range from 13,528 feet at Kings Peak in the Uinta Mountains to 4,150 feet where the Green River exits the basin just above the Price River.

Water development in this basin dates back to the early Mormon pioneers and the American Indians. The Uintah and Ouray Indian Reservation was established in 1861. In 1905 the U. S. Government opened the lands not allotted to the Indians for homesteading and white settlers began making their way into the basin. A short history of local communities' land and water development is presented in Section 3.

## **2.4 Demographics and Economic Future**

This section discusses the basin's population, employment and economic future. Through the years the basin has been plagued by boom and bust relating to oil and oil shale. In spite of these cycles, the basin's population is expected to grow from an estimated 35,546 in 1990 to 87,020 in 2050. Vernal is the largest city with a 1998 population of 7,111.

Uintah Basin employment is projected to increase from 17,823 jobs in 1995 to 28,025 in 2020. Long-term outlook for the economy of the basin is positive, and growth will be in minerals and tourism.

## **2.5 Water Supply and Use**

Section 5 discusses the historical water supplies and present uses. Most of the water used in the basin is for agricultural, municipal and industrial purposes and comes from numerous streams originating in the Uinta Mountains. This water is diverted directly from streams or stored in numerous reservoirs. The primary hydrologic feature of the basin is the Green River which collects flow from the north and south slopes of the Uinta Mountains. Presently developed water supplies in the basin total 811,380 acre-feet. Agricultural irrigation diverts 797,610 acre-feet annually, municipal and industrial 21,430 acre-feet, and 2,500 acre-feet is diverted for secondary water use. Potential average annual diversions to the Wasatch Front are: Strawberry Collection System, 101,900 acre-feet; Strawberry Water Users, 61,500 acre-feet; and Duchesne Tunnel, 31,700 acre-feet. The total of all these diversions is greater than the developed supply because water, primarily agricultural water, is rediverted and reused as it moves through the river

system. Depletions are: agricultural irrigation, 411,310 acre-feet; municipal and industrial, 6,870 acre-feet; and potential Wasatch Front exports, 195,100 acre-feet. Groundwater supplies are used for municipal, industrial and agricultural purposes. An estimated 35,000 acre-feet of groundwater recharge occurs on the south slope of the Uinta Mountains, and 91,000 acre-feet occurs on the north slope.

## **2.6 Management**

This section describes the water management functions of private and government entities. The Central Utah Water Conservancy District and the Uintah Water Conservancy District are the primary water wholesalers in the Uintah Basin. The basin has 47 major irrigation companies and 28 public community providers.

The Uintah Basin has 82 active reservoirs and lakes used for water storage. Thirty-eight are below 1,000 acre-feet in storage. With completion of the Central Utah Project, many of the large dam and reservoir sites will be developed. Future growth may result in smaller dam sites being considered for construction on tributaries and the diversion of Green River water for use in the basin.

Water management enables the delivery of water to people and places at the optimum time and condition. One of the present challenges facing water managers in the Uintah Basin is delivering water for irrigation during dry years or in areas where no reservoir storage is available for spring runoff impoundment for late summer delivery to water users.

Following the current large water project development period, long-range planning will become more crucial. Public involvement and collaboration among competing water interests will be required. There is a growing need for education programs to prepare present and future leaders to make informed choices about how water is managed. Trade-offs between economic and environmental values can best be made by people who understand the nature of water and the role it plays in natural ecosystems and in economic growth.



Red Fleet Reservoir

## 2.7 Regulation/Institutional Considerations

This section discusses the agencies responsible for water regulation in the Uintah Basin. This includes consideration of water rights, water quality and environmental concerns.

The Division of Water Rights, under the direction of the State Engineer, regulates water allocation and distribution and oversees dam safety. Water quality is regulated at the state level by the Department of Environmental Quality through two agencies, the Division of Water Quality and the Division of Drinking Water. Other agencies and organizations that regulate water in the basin are water conservancy districts, special service districts, city water departments, mutual irrigation companies and private water companies. Standards are also set for monitoring frequency and procedures.<sup>6</sup>

Dam safety is a concern. Twenty-five high hazard dams exist in the basin. The high hazard rating does not mean a dam is unstable or in poor repair, but means that if it were to fail there would be loss of life or significant property damage.

Reservoirs in the Uintah Basin attract large crowds of flat-water recreationists. Pollution of the drinking water flowing from these reservoirs is an increasing problem. Overcrowding and associated safety issues, especially at Strawberry and Steinaker reservoirs, are also concerns.

Inclusion of the Colorado pikeminnow (formerly Colorado squawfish), humpback chub, bonytail chub and razorback sucker on the

endangered species list by the U. S. Fish and Wildlife Service (USFWS) has necessitated close coordination with USFWS and other resource agencies for those who wish to alter and diversify the uses of the Green River and its tributary waters. Releases of high flows to simulate spring runoff from Flaming Gorge Dam has impacted the present excellent trout fishery and fishing industry below the dam. Flooding in the Jensen area has occurred and caused damage to farmland and road systems. Also, some of the dikes (ponds) at Browns Park State

Waterfowl Management Area and Ouray National Waterfowl Refuge have been damaged.

Drains installed in the Jensen area by the Bureau of Reclamation to take irrigation return flows to Stewart Lake have created a selenium problem with the wildlife. The drains have been diverted around the lake and now discharge directly into the Green River.

The Mosby Canal was breached in 1997 and joined with water from spring runoff to form an erosion gully 200 feet deep, about 400 feet across and 2,000 feet long. Nearly 1.5 million cubic yards of fine red soil washed into Dry Fork Creek, an important source of irrigation and culinary water for Ashley Valley.

Problems from the sediment closed down the Ashley Valley Water Treatment Plant, filled canals and plugged sprinkler systems. Future erosion and sediment deposition in Dry Fork and Ashley creeks still exist. The Ashley Creek Stabilization Project is being designed to solve these problems.

Adequate environmental water considerations are providing quantity and quality of water to maintain crucial wildlife habitats and populations. Providing instream flow as a beneficial use to maintain fish and wildlife populations, riparian vegetation, and stream channels is widely recognized as important. Wetlands are important for groundwater recharge and discharge, flood storage, shoreline stabilization, sediment trapping, water purification, pollution control, food chain support, and fish and wildlife habitat establishment.

The Uintah Basin has several environmentally sensitive areas. These include the lower 2-1/2 miles of the Duchesne River (which has been designated as critical habitat for the razorback sucker by the U. S. Fish and Wildlife Service), Stewart Lake, Nine Mile Canyon, the Book Cliffs and the High Uinta Wilderness.

## **2.8 Water Funding Programs**

Federal, state and private funding programs are described in Section 8. Funding programs are available to provide loans and grants for many types of water-related projects. The Central Utah Project has spent about \$1.2 billion on water projects by the Bureau of Reclamation. Agencies of state government have provided almost \$31 million to water system development and improvements. The federally funded Colorado River Salinity Control Program has contributed over \$41 million.

## **2.9 Water Planning and Development**

This section describes the major past, present, and proposed water planning and development activities in the Uintah Basin, including a discussion of the Central Utah Project. The current water planning and development in Duchesne and Uintah counties includes determining the projects that will be included in the final phase of the Central Utah Project. The Colorado River Salinity Control Program, a federal, state and local cooperative program ongoing in the Uintah Basin, is discussed.

A list of the water projects receiving financial assistance from the Board and Division of Water Resources is provided in this section. Proposed local water projects such as Red Wash Dam, Lower Ashley Creek Dam, Leota Bench Supplemental Irrigation, Ashley Creek Stabilization, Alta Ditch, Highline, Upper Canal, Red Creek Irrigation, Dry Gulch Class C, Pleasant Valley and Payne Canal are discussed.

Projected demand for irrigation water will decrease from 797,610 acre-feet in 1995 to 781,920 acre-feet in 2050. Municipal and industrial water will increase from 12,110 acre-feet in 1995 to 26,940 acre-feet in 2050. Projects to increase water supplies in the basin are more efficient irrigation

methods, conservation and small reservoir construction.

An issue of concern to water suppliers is that many communities are not adequately planning for future growth. All communities should prepare a long-term water management plan which includes new water supply sources and water conservation programs.

## **2.10 Agricultural Water**

This section discusses the agricultural aspects of the basin. Agricultural activities are an important part of the economy. There are 201,120 acres of irrigated cropland which deplete about 411,310 acre-feet of water annually (mostly for pasture and alfalfa).

Present cropland trends show a decrease to 197,490 acres by 2050. Crop yields have decreased in areas with poor drainage and salt toxicity problems. The Colorado River Salinity Project, however, has helped to increase crop yields through better irrigation practices, such as sprinkler and gated pipe irrigation.

Two water policy issues affecting agriculture are a general shortage of irrigation water during July and August, due to inadequate reservoir storage in the basin, and the reduction of the Colorado River Salinity Control Program. Water storage reservoirs should be constructed on the Yellowstone, Uinta, and Whiterocks rivers and upper and lower Ashley Creek. The Colorado River Salinity Control Program in the Uintah Basin should be fully funded and completed.

## **2.11 Drinking Water**

Section 11 discusses public and private water supplies in the basin and reviews their present status. Towns, cities and counties all have primary responsibility for drinking water quality control in their jurisdiction, under rules set forth by the state. All of the 28 public drinking water systems in the basin have been approved by the Utah Division of Drinking Water.

Most public community culinary water supplies will be adequate into 2050. Verification that a public water system is meeting state and federal



quality standards is made through monitoring programs established by regulations. Rules for Public Drinking Water Systems (RPDWS) outline procedures for local treatment plant operators to follow and the state's responsibilities in water quality testing. The Utah Safe Drinking Water Act and the Federal Safe Drinking Water Act, with all amendments, are discussed as are drinking water problems associated with facility operations and groundwater contamination.

Per capita water use ranges from 223 gallons per capita per day (gpcd) in Duchesne County to 366 gpcd in Daggett County and 240 gpcd in Uintah County. Water use in Daggett County is high due to tourists visiting Flaming Gorge Reservoir.

Drinking water issues revolve around water quality and the protection from contamination by untreated wastewater and treated wastewater effluent, and by poor land use practices involving streams, reservoirs and groundwater aquifers.

## 2.12 Water Quality

Section 12 presents data and information on existing levels of water quality throughout the Uintah Basin. Sources of pollution are identified, problems and solutions are discussed, and a recommendation is given for control and improvement by responsible agencies.

Most of the water in the basin is of good quality. The quality of some surface water streams carries high sediment loads during periods of high spring snowmelt runoff and when high intensity summer storms occur.

An assessment of water quality beneficial use support was made on 2,834 miles (80 percent) of the total stream miles. Of these, 2,208 miles were assessed as fully supporting all of their beneficial uses, 240 miles were assessed as partially supporting, and 386 miles were assessed as non-supporting at least one beneficial use.

Most groundwater pollution is from natural geologic sources such as the Green River and



Mountain meadow, north slope of Uintas

Wasatch formations. Excess selenium and alkali have been monitored in Stewart Lake Waterfowl Management Area, Lower Ashley Creek, Ouray National Wildlife Refuge and Pariette Wetlands.

The NRCS Uinta Basin Salinity Control Project (which includes the Duchesne and Ashley Valley drainages) projects a reduction of 52,400 acre-feet of return flow from on-farm irrigation, deep percolation and off-farm lateral seepage loss. It also projects a total of 111,210 tons of salt load reduction annually to the Colorado River.

Issues impacting water quality in the Uintah Basin are an increase in salt-loading from irrigated agriculture, water and land contamination due to oil/gas well drilling, and elevated levels of total phosphorus and dissolved solids in several basin streams. The federal government should increase funding to the on-farm (USDA) and off-farm Bureau of Reclamation salinity programs to achieve goals in salinity reduction. Also, the Bureau of Land Management, Forest Service and the Utah Division of Water Quality should increase water quality monitoring in selected drainages for any presence of effluent from oil and gas development projects. The Utah Division of Water Quality, Division of Wildlife Resources, U. S. Fish and Wildlife Services, Bureau of Land Management, Forest Service and others should also cooperate in future data-gathering and analysis.

### **2.13 Disaster and Emergency Response**

Section 13 discusses flood hazard mitigation and drought response. It also briefly discusses programs presently in place and additional programs that could be beneficial in dealing with flooding and drought problems. Many types of emergency situations are water-related, including disastrous flooding from earthquakes, landslides and extreme drought. Planning efforts focus on measures that may lessen or eliminate the impact of future disasters. Drought damage can be reduced by precipitation augmentation, water conservation, increasing carry-over storage in reservoirs during non-drought years and drought planning.

The National Flood Insurance Program (NFIP) makes flood insurance available to municipalities as a protection against monetary losses when flooding occurs. Damages for the 1983-1984 (\$10.1 million) and 1997 floods (\$6.4 million) are shown in this section.

Issues impacting disaster and emergency response are that some local governments do not have plans for managing flood plains, and they lack hazard mitigation plans, disaster response plans, and emergency operation plans. Participating NFIP communities should review their flood damage prevention ordinances to insure they are meeting the minimum requirements for participation in the National Flood Insurance Program.

### **2.14 Fisheries and Other Water-Related Wildlife**

Section 14 describes the fisheries and other water-related wildlife currently found in the basin. The Division of Wildlife Resources has responsibility for managing, protecting, propagating and conserving the state's wildlife. The Fish and Wildlife Service has authority to conserve and protect endangered and threatened species on federal and private lands. Responsibilities of the Central Utah Water Conservancy District to augment water supplies and support fish and wildlife interests are briefly explained. Minimum instream flows, watershed protection, stream bank erosion and wetlands protection are the greatest needs for wildlife.

A state wetland protection plan is currently being prepared by the Governor's Office. High priority wetland areas will be identified, and opportunities for protection and enhancement will be addressed. Big game winter rangeland will be purchased under Section 305 of the Utah Reclamation Mitigation and Conservation Commission. Big game crossings and wildlife escape ramps in large canals are also to be provided.

### **2.15 Water-Related Recreation**

Section 15 describes how water relates to recreation. Water is part of almost all recreation provided in the Uintah Basin, from water skiing to camping, to pools in municipal recreation centers, to flat water boating on major reservoirs. Design of water access and recreation features associated with water development projects are important components of water planning and development.

Lists of recreation facilities and campgrounds maintained by the Bureau of Land Management, Dinosaur National Monument, Flaming Gorge National Recreation Area, National Forest Service and state parks are listed for the Uintah Basin. The basin contains five state parks with a total of 308,340 visitations for 1997, including the Natural History Field House in Vernal and four reservoirs.

Issues that impact water-related recreation are unethical behavior in recreational settings and comprehensive planning for allocation of resources. The Division of Parks and Recreation, in cooperation with other recreation agencies, should organize focus groups with recreationists and managers from throughout the state to obtain ideas and support from all members of the recreation community. People who create the conflicts should be represented and encouraged to participate. Also, the Division of Parks and Recreation should continue to implement findings of the Uintah and Diamond Mountain Resource Management plans and the *Flaming Gorge National Recreation Area Management Plan* to balance use and resource capacity to achieve sustainability of water resource uses for recreation.

## **2.16 Federal Water Planning and Development**

Section 16 gives a brief description of various agency programs. Although the activities of federal agencies are changing, many historical programs are still available. To use them, local people must be informed about program functions and how to gain access. With this information, better interagency and local working relationships are possible.

The impact of threatened and endangered species must be considered and planned for in all water planning and development projects. A list of candidates and listed endangered species is presented. Some of the endangered species are razorback sucker, bonytail chub, Colorado pike-minnow (formerly Colorado squawfish), whooping crane, humpback chub, black-footed ferret, barneby ridge-cress, shrubby reed-mustard and the southwestern willow flycatcher.

## **2.17 Water Conservation**

This section discusses conservation ideas and their significance to water planning. The need for water pricing measures to provide stable revenues for water users to improve efficiency is also addressed as an important part of any conservation program.

Water sources presently being developed are expensive. New sources will be even more costly. The time to think about and teach conservation has come. Fortunately, water development in the basin has kept ahead of water needs in modern times.

During the next generation (25-30 years), developed supplies in some systems will become fully used, and scarcity will return to some parts of the basin unless new supplies are developed.

Conversion of some irrigation water to municipal and industrial uses will likely occur. Increasing the efficiency of farm irrigation practices should continue.

Water quality is important in setting up a conservation program. If the goal is to conserve high quality water for meeting culinary growth demand, then providing a separate irrigation pipe network to utilize non-potable water for lawn and garden irrigation may be a logical solution.

Issues impacting water conservation are the need for communities to have plans for future growth, secondary water systems, water-conserving landscapes, and effective water rate schedules. Every community should develop water management and conservation plans and study the feasibility of constructing secondary water systems. Local communities should also study water-conserving landscapes and adopt water rate schedules that encourage water conservation.

## **2.18 Industrial Water**

Section 18 discusses the present and future uses of water for industrial purposes in the Uintah Basin. For this report, industrial water use is defined as water used in mining and manufacturing operations including the production of oil, gas, chemicals, fertilizer or other products. It includes power production, processing, washing, mineral slurring, oil well water-flooding and cooling operations, as well as employee use. Also included, to the extent they can be identified, are such activities as gravel-washing and ready mix concrete production.

Present industrial water use for the Uintah Basin is about 11,830 acre-feet. Hydroelectric and coal-fired power plants have a total capacity of 150,400 kw, with Flaming Gorge producing 145,850 kw.

## **2.19 Groundwater**

Groundwater in the Uintah Basin has been developed for use as public water supplies, irrigation water and stock-watering. Springs were the first method developed to access underground water, followed by wells.

Section 19 describes groundwater conditions in the Uintah Basin. The boundaries of an aquifer are physical, thus they may outcrop, i.e., be offset by faulting against an impermeable rock unit. Aquifers may grade laterally into a lower permeability deposit due to changes in the depositional environment, or they may thin and disappear. At any given location, the land surface may be underlain by several aquifers. Each aquifer may have different chemical quality and different hydraulic potential. Each aquifer may be recharged in a different location and may flow in a different direction. Groundwater



divides do not necessarily coincide with surface water divides. These unique conditions demonstrate that the development and management of groundwater is more complicated than surface water.

Groundwater in the Uintah Basin ranges from fresh (less than 500 milligrams per liter of dissolved solids) to briny (more than 35,000 milligrams per liter of dissolved solids). Well and spring locations are shown in the report. The average annual discharge from wells and springs for domestic and industrial use is 21,060 acre-feet. □